Social Barriers to Entrepreneurship in Africa: The Forced Mutual Help Hypothesis

By Philippe Alby, Emmanuelle Auriol and Pierre Nguimkeu

Formal sector in Africa is small and dominated by entrepreneurs of foreign origin. Social arrangements prevailing in Africa contribute to explain this equilibrium. Local entrepreneurs have the social obligation to provide a job and to redistribute their wealth to their relatives. Consequently, such firms are less productive than their foreign counterparts, which discourages entrepreneurship. Exploiting surveys from 7,514 formal manufacturing firms in 31 Sub-Saharan African countries, the proportion of missing African entrepreneurs is structurally estimated to be between 7% and 13% of the formal sector workforce.

JEL: H53, H55, L26, C51, O14, O17, O55

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On average, Sub-Saharan African countries allocate only 4.8% of their gross domestic product to social security (ILO 2010). This is the lowest level of investment in social protection in any region of the world. In the absence of a public safety net, Africans have developed a culture of “forced mutual help” where wealthy Africans have the social obligation to share their resources with their needy relatives and extended family (Firth 1951). Since becoming an entrepreneur in the formal sector marks economic success, it inevitably involves in the African context substantial family taxation. Combining theoretical and empirical analysis the paper studies how the forced mutual help constraint influences entrepreneurship. The impact of the phenomenon is identified by distinguishing between local entrepreneurs and entrepreneurs of foreign origin. The theoretical analysis shows that the forced mutual help constraint distorts productivity as it leads to an overstaffing of local firms, which as a result are less efficient than foreign firms. Disadvantaged by the family taxation and the misallocation of labor, local people become less often entrepreneurs. We check the empirical validity of our theoretical model predictions by exploiting the World Bank surveys from 7,514 formal manufacturing firms in 31 Sub-Saharan African countries administered between 2002 and 2007. Structural estimations results allow to compute the percentage of missing local entrepreneurs in the formal sector, estimated to range between 7% and 13% of the formal sector workforce.
The study of barriers to entrepreneurship is not new to the literature. Since the seminal paper by Evans and Jovanovic (1989) that has shown the importance of borrowing constraints in entrepreneurial choice using US data, many papers have emphasized that the tightness of credit constraints is a major obstacle to entrepreneurship. In developing countries imperfect capital markets have hence been found to be key determinants of informality (see, e.g., Straub 2005, De Mel et al. 2008, Grimm, Krueger and Lay 2011). Another important determinant of informality, and thus of firm growth, is the existence of entry sunk costs to the formal sector. These costs are proportionally higher in poor countries than in advanced economies. As a result firms in developing countries, especially small ones, remain informal, because becoming formal involves fixed costs that are beyond the reach of poor entrepreneurs (see Djankov et al. 2002, Auriol and Walters 2005). Finally, excessive or inappropriate government regulations have also been found to be a significant constraint to entrepreneurship (e.g., Botero et al. 2004 on labor market regulation). In the African context, additional barriers to entrepreneurship exist for local people. Indeed, almost everywhere in Africa, small and medium enterprise (SME) are mainly in the hands of non-African aliens (Tshikuku 2001). For instance, in his study on SME in Kenya and Zimbabwe, Fafchamps (2004) finds that only 32% of firms are in the hands of indigenous-African. This result is confirmed by Biggs and Shah (2006) who find that in Kenya most firms are in the hands of Asians, while in Zimbabwe they are in the hands of Europeans and to a lesser extent Asians. More generally Biggs and Shah (2006) find that the Indian in East Africa, the European in Southern Africa and the Lebanese in West Africa, dominate many of the major manufacturing activities. The present paper studies the forced mutual help norms prevailing in Africa, another type of barriers to entrepreneurship which can help explain this equilibrium.

There is a substantial literature, mainly anthropological but also economic, on the possible negative impact of solidarity norms on economic development. Platteau (2006) explains that private wealth accumulation is perceived as an anti-social behavior in most traditional Africa. He quotes the anthropologist Woodburn (1998, p. 52) who, based on his observations of Hadza hunter-gatherers in Tanzania, wrote “People who have more than they manifestly need are put under relentless pressure to share”. In fact, in most social networks in Africa sharing is a moral principle whereas personal accumulation is frowned on. The impact of these social norms on economic outcome has been shown to be distortive. For instance, Anderson and Baland (2002) show that women join roscas to protect their savings from their husbands and hence to save at a higher rate than they would at home. Studying credit cooperatives in Cameroon, Baland et al. (2011) find that 20% of the loans are fully collateralized by savings held by the borrowers in the same credit institutions. Yet the net interest payments represents 13% of the amount borrowed. Based on interviews with members of the cooperatives, these authors find that some individuals systematically use credit as a way to pretend that they are too poor to have available savings. This provides them a reason to successfully reject financial requests from friends and relatives. Similarly, Duflo et al. (2011) argue that Kenyan farmers do not invest in fertilizer, although it would substantially raise their yield, because a flourishing farm would make it difficult for them to protect their savings from consumption requests. Bernard et al. (2010) study how the conflict between social norms and economic differentiation precludes the emergence of market-oriented organizations in Burkina Faso. Finally, recent experiments in Kenya and in Liberia confirm that social redistributive pressures create disincentives to make profitable investments. Indeed, within a controlled laboratory environment in rural Kenya, Jakiela and Owen (2012) find that both women and men are willing to pay (i.e. reduce their expected profits) to hide positive income shocks from their community.
(particularly unmarried women as well as men who have recently been asked for gifts or loans by relatives). Likewise, in a similar type of experiment conducted in Liberia Nillesen, Beekman, and Gatto (2011) used both survey and experimental data to show that individuals with strong family ties within the community tend to make lower profitable investments than individuals with weaker family ties, and are also willing to pay to hide their money.

These works support the hypothesis that kinship networks may hamper profitable investments, as people may be unwilling to forcibly share their wealth with their relatives. However, none of them study how this problem might affect the decision to become an entrepreneur and thus the development of a modern productive sector. The only paper we are aware of that looks at the issue of entrepreneurship in this context is Grimm et al. (2013) whose focus is on the informal sector. Their paper contributes to the literature on capital returns in small informal firms by analyzing whether kinship networks act as a constraint or an asset to informal entrepreneurs. They use the 1-2-3 surveys, an original data set covering informal entrepreneurs in seven West-African agglomerations. They find that local social networks within the city have positive effects on factor use and hence added value, presumably by easing credit and insurance markets constraints. However, they also find robust negative effects associated with social networks tied to the village of origin. These effects get diluted with geographical distance, probably because with rising distance it is easier to hide the generated income and to protect it from abusive requests. The present paper is complementary to Grimm et al. (2013) as it focuses on the formal manufacturing sector and examines the decision to become an entrepreneur. Moreover, in addition to the reduced-form evidence it uses a structural econometric approach that allows to estimate the proportion of missing entrepreneurs due to mutual help constraints and to discuss welfare policy implications.

To guide the analysis, we model the choice of individuals with idiosyncratic abilities and a fixed amount of capital, between becoming entrepreneurs or wageworkers. We distinguish between foreign and local entrepreneurs. Contrary to the former, local entrepreneurs have the social obligation to subsidize their family. We show that they minimize the burden of the family tax by employing their needy relatives. This strategy maximizes the entrepreneurs’ net profit as it allows them to receive some labor in exchange for these subsidies. However, recruiting family and relatives rather than the best qualified workers distorts productive efficiency. Everything else being equal local firms are less productive and less profitable than firms owned by foreigners. Reduced profit margins discourage entrepreneurship: with similar credit constraint and entrepreneurial ability local people become less often entrepreneurs than foreigners. We derive from the model three main sets of predictions. First, the labor force of local firms, of which a significant proportion comes from the pool of the manager’s relatives and extended family, is less qualified and less competent than the labor force of foreign firms. This implies that the labor force composition and the nature and amount of training programs offered by the local firms must differ from those of foreign ones. Second, local firms have larger labor force embodied in a larger labor/capital ratio. Third, the labor productivity of local firms is lower than the labor productivity of foreign firms. Finally, if the problem of forced solidarity is indeed relevant, the results should be different in countries with relatively better social protection than countries with relatively worse.

The empirical relevance of the model predictions is assessed using the Enterprise Surveys database on manufacturing firms maintained by the World Bank. To date, this is the most comprehensive database on formal firms in Sub-Saharan Africa. We compile surveys from 7,514 formal manufacturing enterprises in 31 Sub-Saharan African countries performed between 2002 and 2007. Estimations reveal that African entrepreneurs are credit constrained, which is consistent with pre-
vious results in the literature. More interestingly they reveal that African entrepreneurs are also constrained on the labor market. The way firms recruit new employees, the labor force composition, the training programs, and the labor to capital ratio and labor productivity estimations are all consistent with the model predictions. We also exploit our theoretical model and the surveys on workers employed in formal manufacturing firms to perform a structural estimation of the model. This allows us to estimate the fraction of missing African entrepreneurs, that is, the proportion of African wagemakers who would have chosen to become entrepreneurs if the social redistributive pressure was nonexistent. Structural estimates are obtained by maximizing a likelihood function constructed by matching the expected probability of occupations as generated by the model to the actual occupational status observed in the data. This likelihood function is obtained as a mixture of the parametric distributions of foreign and local people specific skills, but also through semi-parametric techniques. This allows to account for possible qualitative differences in skills across locals and foreigners, but also to overcome possibly distributional misspecification. The results show that between 7% to 13% of African workers are self-excluded from entrepreneurship due to social redistributive pressure. Throughout the empirical analysis, we use the Institutional Profiles Database maintained by the Research Center in International Economics (CEPII) as a complementary source of data to assess the presence of social safety nets within each country. An Institutional Solidarity Index (ISI hereafter) is computed for 21 of the 31 African countries surveyed by the World Bank. We split the countries into two sub-samples according to whether they are worse or better than the sample median ISI. Regressions show that local firms located in countries with poor social protection are more affected by the forced mutual help constraint than firms located in countries with better social protection. Accordingly, the estimated proportion of missing entrepreneurs is higher in the former relative to the latter.

Section I formulates a model of entrepreneurial choice which formalizes the forced mutual help constraint for local entrepreneurs and from which we derive a set of testable predictions. Section II assesses the relevance of the theory on a sample of 31 African countries, through reduced form regressions. Section III presents the structural estimations from which the fraction of missing entrepreneurs is computed. Policy implications and limitations are also discussed. Section IV offers some concluding remarks. Most tables and figures as well as supplementary estimation procedures and results are gathered in the Appendix.

I. The Model

The model is an extensively amended version of Evans and Jovanovic (1989). The economy is populated with a continuum of potential entrepreneurs. They are heterogeneous in their ability (e.g., different education level, human and social capital) captured by a parameter $\theta > 0$. To keep the exposition simple we assume the production function has a Cobb-Douglas specification

\begin{equation}
Y = \theta K^\alpha L^{1-\alpha} \quad \alpha \in (0, 1)
\end{equation}

where $K$ is the stock of capital and $L$ is the quantity of labor used in the firm of an entrepreneur with ability $\theta$. We assume that the maximum stock of capital available to the entrepreneur, $K$, is constrained and may vary from one individual to the other. This assumption is consistent with the fact that entrepreneurs are credit constrained in Africa. In contrast, labor supply is plentiful, consistent with the high rates of unemployment observed in Africa. The quantity of hired labor, denoted $L$, is therefore optimized freely by entrepreneurs. The unit price of capital is $r$ and the unit

\footnote{We use the Cobb-Douglas function to ease the exposition and the economic interpretations, but it is possible to show that our results hold for a general specification of the production function with standard assumptions.}
price of labor is $w$. Each individual has one unit of labor that he can use either to supervise work in his firm as an entrepreneur or to work as an employee for the wage $w > 0$. The optimal occupational choice depends on the capital available to the agent and on his ability. The model distinguishes between local entrepreneurs, identified by the subscript $l$, and foreign entrepreneurs identified by the subscript $f$. Local entrepreneurs face the social obligation to support their relatives. We assume that they have to pay a tax $T \geq 0$ to their extended family and relatives. We focus on a lump sum tax as it is a priori less distortive than a proportional tax and is consistent with the fact that relatives do not necessarily observe entrepreneurs’ profit. In fact, empirical evidence show that local entrepreneurs will do everything they can to hide this information (see Jakiela and Owen 2012, Nillesen, Beekman, and Gatto 2011, Baland et al 2011). Nevertheless our results are robust to the introduction of a proportional tax (see the discussion below). Entrepreneurs can pay the family tax either directly in cash or by hiring their relatives for a wage $w$. Since needy relatives are hired in the firm more for the extent of their relationship with the business-owner than for their qualifications they tend to be less efficient than regular workers chosen for their qualifications only.\footnote{The entrepreneur is confronted with a cream-skimming problem. The most productive and educated relatives are certainly able to find a position elsewhere or also become entrepreneurs. People who ask for permanent help in the form of a job will usually be the less productive ones.} The productivity of one unit of labor by a relative is $\beta \leq 1$, while a regular worker’s productivity is 1. The amount of productive labor available to a local firm is then

\begin{equation}
L_l = L + \beta L_r \tag{2}
\end{equation}

where $L_r$ is the number of relatives hired in the local firm and $L$ the number of workers hired outside the family network. In contrast, a foreign firm hires workers for their qualifications only. The amount of productive labor available is simply $L_f$, the number of workers hired by the firm.

\begin{equation}
L_f = L \tag{3}
\end{equation}

Finally, since we are focusing on formal enterprises in our application, starting a firm should usually involve sunk costs in the form of entry/registration fees in developing countries. Adding such fixed costs would not change the implications of the paper as both local and foreign firms are subject to it. We thus assume it away. In what follows we study the benchmark case of a foreign entrepreneur.

\subsection*{A. Entrepreneur Without Family Liability}

We study the incentive an individual might have to become an entrepreneur. He might work for a wage $w$ or use his time to supervise work on his own firm as an entrepreneur. An entrepreneur is credit constrained so that he can borrow at most $K$. Without any loss of generality the price of the output is normalized to 1. Since the stock of capital that can be invested is constrained by $K$, the entrepreneur optimizes his profit with respect to $L$ for any $K$. The objective function of the entrepreneur is

\begin{equation}
\max_{L \geq 0} \Pi_f(L) = \theta K^\alpha L^{1-\alpha} - wL - rK. \tag{4}
\end{equation}

The first order condition is

\begin{equation}
(1 - \alpha)\theta K^\alpha L^{-\alpha} - w = 0. \tag{5}
\end{equation}

Clearly, the objective function is concave in $L$ so that the optimal employment level is:
Substituting $L_f$ in (4), the profit of the foreign entrepreneur with ability $\theta$ and a stock of capital $K$ is:

$$\Pi^f(\theta) = \left[ \frac{\alpha}{1-\alpha} \left( \frac{(1-\alpha)\theta}{w^{1-\alpha}} \right)^{\frac{1}{\alpha}} - r \right] K.$$  

(7)

$\Pi^f(\theta)$ is linear in $K$, which implies that the optimum is reached either for 0 or for the maximum value. We deduce that the agent with ability $\theta$ and borrowing capacity $K$ will choose to become an entrepreneur if his profit is higher than his earning as a wageworker. That is, if $\Pi^f(\theta) \geq w$. In this case he chooses to invest the maximum possible amount $K$ in his firm. Let $\theta^f(K)$ be the value of $\theta$ for which $\Pi^f(\theta) = w$.

$$\theta^f(K) = \left( \frac{w + rK}{K} \right)^{\frac{\alpha}{\alpha(1-\alpha)^{1-\alpha}}} \frac{w^{1-\alpha}}{\alpha^{\alpha}(1-\alpha)^{1-\alpha}}.$$  

(8)

The following proposition is easily deduced from the above results.

**PROPOSITION 1:** An agent of foreign origin with access to capital $K$ chooses to become entrepreneur if and only if $\theta \geq \theta^f(K)$.

Highly talented people (i.e., those with ability above $\theta^f(K)$) choose to become entrepreneurs. A great concern in developing economies that has been addressed in several papers in the literature is that people who are credit constrained, do not become entrepreneur, even if they are very talented. Indeed it is straightforward to check that the critical threshold $\theta^f(K)$ is decreasing in $K$. Because of lack of credit, talented entrepreneurs end up as wageworkers, while less able, but wealthier individuals may become entrepreneurs. However, there is an ability threshold, $\theta^* = \frac{r^\alpha w^{1-\alpha}}{\alpha^\alpha(1-\alpha)^{1-\alpha}}$, that depends only on technology and market characteristics, below which an individual never becomes an entrepreneur, regardless of their level of wealth.

B. Local Entrepreneur

We now study the incentive to become entrepreneur for local people. They aim to maximize their net income under the constraint that they pay the family tax $T$ for which they have to find the optimal way to do it. They spread this tax between wage payments (labor contracts) and direct transfers to family members. They solve:

$$\max_{L \geq 0, L_r, \tau} \Pi^l = \theta K^\alpha L_l^{1-\alpha} - w(L + L_r) - rK - \tau T$$

s.t. $$L + \beta L_r = L_l$$

$$\tau T + wL_r = T$$

If we add entry sunk costs $F$, the entry condition becomes $\Pi^f(\theta) \geq w + F$. The results can therefore be generalized by substituting $w + F$ by $w$. 

4
The first constraint is the amount of productive labor available to the firm when it hires $L$ qualified workers and $L_r$ relatives. The second constraint is the family tax that can be paid either in wages, $wL_r$, or in cash $\tau T$, where $\tau \in [0, 1]$ is the fraction of the tax that is given directly in cash. We deduce that $L_r = \frac{1-\tau}{w} T$ and that $L_l = L + \beta \frac{1-\tau}{w} T$. Substituting $L_r$ and $L_l$ by their value in the objective function and simplifying yields:

$$
\max_{L, \tau} \Pi_l = \theta K^\alpha \left( L + \beta \frac{1-\tau}{w} T \right)^{1-\alpha} - wL - rK - T
$$

It is straightforward to check that, for all $\beta \geq 0$, the objective function is decreasing in $\tau$ so that the optimum is at $\tau^* = 0$. At the limit when $\beta = 0$ the entrepreneur is indifferent between hiring his relatives or paying a cash transfer. This result is collected in the following proposition.

**PROPOSITION 2:** Independently of the value of $\beta \geq 0$ a local entrepreneur always prefers to pay the family tax by hiring his relatives in the firm.

Note that Proposition 2 does not depend on the way the family tax is deducted. For instance with a proportional tax with rate $t$ on profit, the tax constraint becomes $t\Pi_l = wL_r + \tau \Pi_l$. The amount that the entrepreneur pays in cash (i.e., without any labor compensation) is $\tau \Pi_l = t\Pi_l - wL_r$. The entrepreneur then maximizes $\Pi_l (1 - \tau) = \Pi_l (1 - t) + wL_r$, where $\Pi_l = \theta K^\alpha (L + \beta L_r)^{1-\alpha} - wL - wL_r - rK$. This objective function is increasing in $L_r$. Hence, the entrepreneur who pays a proportional tax on profit to his family pays it preferably in the form of wages in exchange for labor. Proposition 2 is not financially intuitive because by hiring relatives the entrepreneur reduces the productivity of the firm, and thus its profit. This is especially true when $\beta$ is very low. However it is optimal for the entrepreneur from a utility perspective. Indeed, he is not interested in maximizing the productive efficiency or the firm’s profit. He is interested in maximizing his net income. The entrepreneur who must pay a tax would rather get some in-kind compensation for it than nothing. Family taxation is thus socially distortive because it creates an incentive to hire inefficient workers. It drives the local firms away from the productive efficiency frontier. In practice, however, entrepreneurs pay the family tax both by employing their relatives and by giving direct cash transfers to family members without necessarily envolving them in the firm. But the latter cases are usually small amounts and/or one-shot requests (e.g., for funerals, weddings, hospital fees, medicines) or requests from people who live too far away or are too young to work (e.g., for schooling or migration costs).

We next compute the optimal employment level in the local firm. It is easy to check that the objective function is concave in $L$. The first order condition, which is also sufficient, is:

$$
\frac{\partial \Pi_l}{\partial L} = (1 - \alpha) \theta K^\alpha \left( L + \beta \frac{1-\tau}{w} T \right)^{-\alpha} - w = 0.
$$

Since $\tau^* = 0$ we have $L_r^* = \frac{T}{w}$ so that Equation (10) is equivalent to:

$$
(1 - \alpha) \theta K^\alpha \left( L + \beta \frac{T}{w} \right)^{-\alpha} = w.
$$

We are grateful to Marcel Fafchamps for pointing this out.
The quantity of external labor that maximizes the firm profit is:

\[(12) \quad L = \left( \frac{\theta(1-\alpha)}{w} \right)^{\frac{1}{\alpha}} K - \beta \frac{T}{w}. \]

Depending on the parameters values, \( L \) is not always positive. The optimal level of external hiring for a local firm is then:

\[(13) \quad L^* = \text{Max} \left\{ 0, \left( \frac{\theta(1-\alpha)}{w} \right)^{\frac{1}{\alpha}} K - \beta \frac{T}{w} \right\}. \]

We deduce that \( L^* > 0 \) if and only if \( \theta > \frac{w}{1-\alpha} \left( \frac{\beta T}{w K} \right)^{\alpha} \). In order to rule out corner solution (i.e., \( L^* = 0 \)) in the sequel of the paper we make the following assumption.

\[A1 \quad \alpha + \beta \leq 1.\]

As it will become clearer later, Assumption A1 implies that if an individual chooses to become an entrepreneur then his \( \theta \) is large enough so that \( L^* > 0 \), i.e., \( \theta > \frac{w}{1-\alpha} \left( \frac{\beta T}{w K} \right)^{\alpha} \). By ruling-out pure family businesses, this assumption is consistent with the data where formal local firms hire both family workers and outside qualified workers (see Table A4).

Substituting \( L_r^* \) and \( L^* \) in the objective function (9), the entrepreneur’s earning is:

\[(14) \quad \Pi^l(\theta) = \left[ \frac{\alpha}{1-\alpha} \left( \frac{(1-\alpha)\theta}{w^{1-\alpha}} \right)^{\frac{1}{\alpha}} - r \right] K - (1-\beta)T. \]

Let \( \Delta \Pi = \Pi^f(\theta) - \Pi^l(\theta) \). Comparing (7) and (14), we have:

\[(15) \quad \Delta \Pi = (1-\beta)T \geq 0. \]

Since local entrepreneurs pay to their relatives and to outside workers equal wage for a less qualified labor it is intuitive that local firms’ profit is lower than foreign firms’ profit. However, this gap is smaller than \( T \) and decreases with \( \beta \). At the limit, when \( \beta = 1 \), the two types of firms are equally profitable. This result further justifies why local entrepreneurs would have a strong incentive to support their relatives by employing them rather than giving direct cash transfers. It reduces the burden of the family tax and narrows their revenue gap. Consequently, they would also have more incentives to train them in order to increase \( \beta \). In the empirical section we examine how training is used by firms for such purpose.

We next compute the threshold value of \( \theta \) for which a local individual is willing to become an entrepreneur. An agent with characteristics \( \theta \) and \( K \) will choose to become an entrepreneur if his expected profit is higher than his earning as a wageworker. That is, if \( \Pi^l(\theta) \geq w \). Let \( \theta^l \) be the value of \( \theta \) for which \( \Pi^l(\theta) = w \). Then,

\[(16) \quad \theta^l(K) = \left( \frac{w + rK + (1-\beta)T}{K} \right)^{\alpha} \frac{w^{1-\alpha}}{\alpha^\alpha (1-\alpha)^{1-\alpha}}. \]
The agent chooses to become an entrepreneur if and only if \( \theta \geq \theta_l(K) \). One can check that \( \theta_l(K) > w - \alpha(\beta T w K) \) is equivalent to \( \frac{w + rK}{1 - \alpha} + \frac{1 - \beta}{\beta} > \frac{1}{1 - \alpha} \), which is always true under Assumption A1. Hence, if an agent becomes an entrepreneur he necessarily chooses a strictly positive level of external labor \( L^* > 0 \). A comparison of Equations (8) and (16) shows that a local individual with capital \( K \) and ability \( \theta \) is less likely to become an entrepreneur than a foreigner with the same characteristics, i.e., \( \theta_l(K) \geq \theta_f(K) \).

**PROPOSITION 3:** Local people choose to become entrepreneur if and only if \( \theta \geq \theta_l(K) \).

It is straightforward to verify that \( \theta_l(K) \) is decreasing and convex in \( K \). Moreover, if \( w \leq 2K \) then \( \theta_f(K) \) is also convex in \( K \). In fact, it is reasonable to believe that employees who decide to quit their job to start their own firm would usually have at their disposal an amount of starting capital that is at least as high as half of their one-period salary. Figure 1 gives a graphical illustration of the selection to entrepreneurship under this assumption. The shaded areas below the curves \( \theta_l(K) \) and \( \theta_f(K) \) represent local and foreign wageworkers, respectively, while the regions above these curves represent the respective entrepreneurs.

Notice that the gap between local and foreign entrepreneurs entry decision, \( \Delta \theta(K) = \theta_l(K) - \theta_f(K) \), decreases with increasing values of \( K \). Indeed, one can easily check that

\[
\frac{d \Delta \theta(K)}{dK} \leq 0.
\]

Thus, the entrepreneurship gap is larger in countries where credit constraints are tighter. This is likely to be the case in the least developed countries. In such countries, the social obligation to help relatives is also the strongest. With small level of capital available for potential entrepreneurs, the family tax weighs heavily on the growth of the formal productive sector.

**C. Testable Implications of the Model**

As derived above, the theory implies that local entrepreneurs pay the family tax preferably by hiring their relatives (see Proposition 2). They should thus hire significantly more through informal
channels than their foreign counterparts. Moreover, if the theory is consistent with the data we should expect the labor force of local firms to be less qualified and less competent than the labor force of foreign firms. We examine the labor force composition (i.e., the proportion of unqualified workers) to assess the relevance of this point. We also look at the training programs offered by the firms to their variety of employees. Indeed, if workers are hired as a response to social constraints rather than their qualification, local entrepreneurs might want to improve their productivity by training them and hence reduce the profit gap $1 - \beta$. Focusing on the level of employment, the theory predicts that, everything else being equal, a local firm has a larger labor force than a foreign firm:

$$\frac{L_l}{K_l} = \left( \frac{\theta(1 - \alpha)}{w} \right) \frac{1}{\alpha} + (1 - \beta) \frac{T}{wK_l} \geq \frac{L_f}{K_f} = \left( \frac{\theta(1 - \alpha)}{w} \right) \frac{1}{\alpha},$$

where $L_l = L^* + L^*_r$, with $L^*_r = \frac{T}{w}$, and $L^*$ and $L_f$ defined by Equations (13) and (6), respectively.

Finally, Equation (18) also implies that local firms are less productive than foreign ones, that is

$$y_l = \theta \left[ \frac{K_l}{L_l} \right]^\alpha \leq y_f = \theta \left[ \frac{K_f}{L_f} \right]^\alpha.$$  

The next section describes some important features of the data used for this study and empirically assesses the role of forced solidarity on entrepreneurship in Sub-Saharan Africa.

II. Data and Regression Analysis

In this section, we provide descriptive statistics and run several reduced-form multivariate regressions over a rich set of variables that includes or is related to some of those appearing in the theoretical model. The aim is to perform some basic tests to confirm that the data are consistent with most of the model implications, before we can proceed to the structural parameter estimation as well as the computation of the proportion of missing entrepreneurs in Section III.

A. The Data

We use the World Bank Enterprise Surveys, a detailed database that contains information on formal firms and their employees in Sub-Saharan Africa. This is, to date, the only database that extensively covers the formal sector of the African continent as a whole, using standardized questionnaires.\(^6\) While the surveys encompass both services and manufacturing sectors, our focus in this paper is only on the latter because the former does not contain information on labor composition and very little information on firms capital. This database compiles surveys from 7,514 manufacturing enterprises in 31 Sub-Saharan Africa countries administered between 2002 and 2007.\(^7\) Standardized survey instruments and a uniform sampling methodology are used to minimize measurement errors and yield data that are comparable across different economies. These surveys have been designed to be representative of the formal economy and cover small, medium-sized and

\(^6\)Available at http://www.enterprisesurveys.org/.

\(^7\)The surveyed countries are Eritrea, Ethiopia and Zambia in 2002; Kenya, Lesotho, Mali, Senegal, South Africa, Tanzania and Uganda in 2003; Benin in 2004; Madagascar, Malawi, Mauritius and Niger in 2005; Angola, Botswana, Burkina Faso, Burundi, Cameroon, Cape Verde, DRC, Gambia, Guinea, Guinea Bissau, Mauritania, Namibia, Rwanda, Swaziland, Tanzania and Uganda in 2006; Ghana, Mozambique, Senegal and South Africa in 2007.
large enterprises of the manufacturing sector.\footnote{The manufacturing sector consists of 12 two-digit (ISIC) industry classifications: agro-industry, chemicals and pharmaceuticals, construction, electronics, food and beverages, garments and leather, metals and machinery, mining and quarrying, non-metallic and plastic materials, paper, textiles, wood and furniture.} The sample size of the selected industries are large enough to conduct statistically robust analyses with standard asymptotic tools. The surveys provide information on firm performance, employers’ perceptions of investment climate and measures of obstacles hindering firm operations and growth (see Appendix A.A1 for more details).

We also use Institutional Profiles Database as a complementary set of data to assess the presence of social safety nets within each country in our sample.\footnote{Research Center in International Economics (CEPII), \url{http://www.cepii.fr/anglaisgraph/bdd/institutions.htm}.} This database contains various indicators on the institutional characteristics of 123 developed and developing countries covering 96% of the world population and 99% of the world GDP. For the purpose of the present analysis we focus on the institutional solidarity index available for 2001, 2006 and 2009. This particular index incorporates sickness, unemployment and retirement coverage for workers. For each of these coverage a score between 0 (no protection) and 4 (large protection) is attributed.\footnote{The score of 0 implies that there is no coverage by neither public nor private institutions for sickness, retirement or unemployment. When such coverage exists, scores from 1 (small proportion of the population covered) to 4 (very large proportion of the population covered) are assigned.} From these three components, an Institutional Solidarity Index (denoted ISI) is computed for each year in each country as the average of the three scores weighted by their standard deviation. Since the timing of both databases differs and given that institutional solidarity is less volatile than firms’ performances we compute the average ISI for the period 2001, 2006 and 2009. We obtain an index of institutional solidarity for 21 African countries out of the 31 surveyed by the World Bank. The values of this index in our sample range from a minimum of 0.00 for Namibia to 2.72 for Mauritius.

Although entrepreneurs nationality is not available in the Enterprise Surveys the ownership structure of the firms is. Hence, the key variable used throughout the paper to distinguish between “local” and “foreign” firms is the firm’s ownership status. In other words, we proxy the firm’s origin between “local” and “foreign” by assuming that an entirely domestically owned firm is a local firm, whereas a firm financed (even marginally) by foreigners cannot be classified as a local family business and is then categorized as a foreign firm. In particular, the latter has the possibility to escape from local forced family taxation by appointing a foreign manager. We distinguish entirely domestically owned firms, labeled “domestic firms”, from others (i.e., mixed or fully foreign ownership structures) labeled “foreign firms”. As shown in Table A1 in Appendix A our classification works well in pinning down local family businesses. Indeed, in 98% of cases the largest shareholders in these entirely domestically owned firms are individuals and/or families among which 85% of them are managers of the firms. In contrast, only 80% of “foreign firms” are entirely owned by an individual or a family, who are less often managers of the firm. Table A1 also shows that foreign firms are significantly larger than domestic ones. Roughly, 55% of private domestic firms have less than 20 workers, compared to 24% for private foreign ones. Conversely, only 13% of domestic firms have more than 100 employees, compared to 41% of foreign ones. Table A2 in the appendix shows that local firms tend to specialize in traditional industries such as wood and furniture or garments and leather, while foreign firms tend to specialize in more high-tech industries such as agro-industry, chemicals and pharmaceutical, or non-metallic and plastic material. Local firms are also significantly less present in textile and construction. This seems consistent with local firms trying to cope with their relatively low quality workforce by specializing in industries that do not require highly skilled workers. Finally, since local and foreign firms might have different wealth endowments, they may face different constraints on the credit market. The descriptive statistics on credit and financing given in Table A3 shows that foreign firms have more often an overdraft.
facility or a line of credit (58% versus 39%) and apply more often for loans than domestic firms (28% versus 23%), even though the former are more frequently less in need of these loans than the latter (52% versus 32%). This is because unlike foreigners, locals are more pessimistic about the credit market. While 15% of them simply do not believe they will be approved, the remaining fraction are more discouraged than their foreign counterparts by factors such as the complexity of the application procedures, high interest rates and high collateral requirements. They also tend to rely more on their personal assets for collateral compared to foreigners who prefer to use machinery.

If social pressure to hire relatives and extended family exists, it should affect the channels through which firms recruit new workers. Table A4 in the appendix shows that domestic firms rely heavily on informal sources to meet their recruitment needs. In 64% of the cases they report using family and/or friends networks to hire new employees, a sharp contrast with foreign firms which in 59% of the cases rely on formal means such as public announcements and public or private placement offices, etc. Our theory also highlights that the social pressure which forces local entrepreneurs to hire their relatives translates into a relatively poor quality of the workforce in local firms. The descriptive statistics of the labor force composition presented in Table A5 in the appendix seems to support this argument. It reveals an over representation of unqualified workers in these firms with a supervision ratio (number of non production workers per production worker) of 13 percentage point lower in domestic firms compared to foreign firms. Moreover, not only production workers are over represented in domestic firms, they are also significantly less educated. The proportion of domestic firms with average education level for production workers below 6 years is 42%, that is 11 percentage point higher than foreign firms. The relatively low qualification of relatives and extended family workers as assumed by the theory implies that local firms will tend to find a way to improve the productivity of these workers in order to narrow their profit gap. Table A6 in the appendix presents internal training schemes by firms to their employees. The proportion of firms offering training is lower for domestic firms compared to foreign ones. However, when domestic firms do offer such programs, they spend a significantly higher amount of time training these workers, compared to foreign firms. Local workers require on average about 2 more weeks of training (for the skilled) and 3 more weeks of training for the unskilled than their foreign counterparts.

Although the above descriptive statistics corroborate with the forced mutual help hypothesis, one can think of alternative explanations that would produce similar empirical results. For example, family workers might actually be a preferred alternative for many reasons. In the presence of adverse selection, particularly among workers with no credentials, local firms could use informational rents to attract a better quality of family workers (albeit unqualified), train them more (because they will stay around longer) and provide less supervision (because they are more trustworthy). Evidence that networks play precisely this role of allocating less credentialed workers into higher skilled occupations in a different cultural context can be found in Munshi (2003, 2011). Another positive impact of family labor is that they might somehow ease credit and insurance markets constraints. This is at least the way Grimm et al. (2013) explain how local family network within the city can have positive effects on production factors and added value in their sample of informal firms. Whether “family hiring” has an overall positive or negative effect in the formal sector of Sub-Saharan Africa can be assessed by examining firms’ profitability. Our theoretical model emphasizes that domestic firms should perform poorly compared to other firms: the social redistributive pressure born by local entrepreneurs leads to an inefficient allocation of labor which reduces domestic firms’ productivity. However, if for the reasons evoked above family members were the preferred

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11 We are grateful to Andrew Foster for suggesting this discussion.
12 However they also find negative effects associated with social networks tied to the village of origin.
alternative we should observe that local firms tend to perform better than the foreign ones. But Figure 2 shows that domestic firms are significantly less productive than foreign ones, and this underperformance is consistent across all categories of firms (small, medium and large). Although these descriptive statistics are consistent with our theoretical results, the differences in workforce composition, training schemes or profitability do not account for other firms’ characteristics. We now turn to regression analysis to examine these preliminary results with a more complete set of controls.

B. Regression Results

The variables used in the regressions are described in Table A7 in the appendix. With missing data the sample size is reduced to 4,500 observations. In particular the information on the capital of the firm is not always available. In each specification the regressions are run with country, year and economic sector fixed effects, after controlling for firms’ size and other characteristics. Standard errors are clustered at the country/industry level.

In the first set of regressions presented in Table 1, we focus on the prediction related to the workforce composition. Our dependent variable is the labor to capital ratio (in logs). We regress this variable over a dummy variable controlling for the type of firm (Domestic firm). In all the regressions this variable of interest or its interaction with other variables are significantly positive, as expected. Column (1) controls for basic firms’ characteristics such as age, location, stock of capital, ISO certification and export status. It also controls for workforce and management characteristics, such as the experience of the top manager, whether workers education and skills is a major concern for the firm, and the presence of training programs within the firm. We introduce in the second specification, Column (2), an interaction of training programs with our dummy variable of interest (Domestic firm). This interaction term is estimated as positive and significant, implying that training practices differ across local and foreign firms. Introducing different measures of firms’ access to credit in Columns (3), (4) and (5) (e.g. overdraft or credit facilities, access to credit is a
major constraint, and a dummy controlling for whether 100% of firms’ working capital is financed through internal funds) does not change the basic results. However, these new sets of regressions confirm that firms are credit constrained and tend to adopt more capital intensive technologies when they have overdraft or credit facilities.

Table 1—Explaining Labor to Capital ratio

<table>
<thead>
<tr>
<th>Equations</th>
<th>Constant</th>
<th>Domestic firm</th>
<th>Firms’ characteristics</th>
<th>Workforce characteristics</th>
<th>Access to credit</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(25.68)</td>
<td>(22.75)</td>
<td>(18.93)</td>
<td>(19.15)</td>
<td>(17.78)</td>
</tr>
<tr>
<td></td>
<td>0.395***</td>
<td>0.218</td>
<td>0.393***</td>
<td>0.556***</td>
<td>0.372**</td>
</tr>
<tr>
<td></td>
<td>(3.42)</td>
<td>(1.48)</td>
<td>(3.20)</td>
<td>(3.41)</td>
<td>(2.18)</td>
</tr>
<tr>
<td></td>
<td>0.170***</td>
<td>0.213***</td>
<td>0.210***</td>
<td>0.210***</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(2.57)</td>
<td>(2.99)</td>
<td>(2.94)</td>
<td>(2.91)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>-0.194</td>
<td>-0.144</td>
<td>-0.142</td>
<td>-0.137</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(1.02)</td>
<td>(0.76)</td>
<td>(0.75)</td>
<td>(0.73)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>-0.457***</td>
<td>-0.380***</td>
<td>-0.390***</td>
<td>-0.384***</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(3.20)</td>
<td>(2.59)</td>
<td>(2.66)</td>
<td>(2.64)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>-0.254</td>
<td>-0.206</td>
<td>-0.212</td>
<td>-0.195</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(1.52)</td>
<td>(1.20)</td>
<td>(1.24)</td>
<td>(1.15)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>-0.139</td>
<td>-0.100</td>
<td>-0.101</td>
<td>-0.556**</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(1.20)</td>
<td>(0.87)</td>
<td>(0.87)</td>
<td>(2.48)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>0.079*</td>
<td>0.566**</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(1.77)</td>
<td>(2.29)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>-0.999*</td>
<td>-0.089*</td>
<td>-0.088</td>
<td>-0.085</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(1.92)</td>
<td>(1.67)</td>
<td>(1.64)</td>
<td>(1.59)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>-0.282**</td>
<td>-0.279**</td>
<td>-0.278**</td>
<td>-0.285**</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(2.49)</td>
<td>(2.27)</td>
<td>(2.25)</td>
<td>(2.28)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>-0.833***</td>
<td>-0.599***</td>
<td>-0.483**</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(5.82)</td>
<td>(2.60)</td>
<td>(2.08)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>-0.294</td>
<td>-0.441*</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(1.36)</td>
<td>(1.95)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>-0.143</td>
<td>-0.143</td>
<td>-0.139</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(1.17)</td>
<td>(1.17)</td>
<td>(1.14)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>-0.196</td>
<td>-0.198</td>
<td>-0.197</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(1.14)</td>
<td>(1.15)</td>
<td>(1.16)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>0.38</td>
<td>0.38</td>
<td>0.39</td>
<td>0.39</td>
<td>0.39</td>
</tr>
<tr>
<td>R-squared</td>
<td>0.38</td>
<td>0.38</td>
<td>0.39</td>
<td>0.39</td>
<td>0.39</td>
</tr>
</tbody>
</table>

| Dependent Variable : Labor/Capital ratio (log) | (1) | (2) | (3) | (4) | (5) |

* OLS Method, Standard errors are clustered at the country / industry level.
* Absolute value of robust t-ratios in parentheses.
* * significant at 10%; ** significant at 5%; *** significant at 1%

In reality, social redistributive pressure on local entrepreneurs could be attributed to the absence of public safety net. In this case, local entrepreneurs should be under less pressure to hire their relatives in countries that offer more social protection. To assess the relevance of this idea, we split the sample of countries in two subsamples according to their Institutional Solidarity Index described in Section II.A. We label by “Worse Solidarity Sample” countries whose ISI is relatively low (ISI below the sampling median), and by “Better Solidarity Sample” countries with relatively high ISI (ISI above the sampling median). The first subsample consists of 14 countries including Angola, Burkina Faso, Cameroon, DRC, Ethiopia, Madagascar, Mali, Mauritania, Mozambique,
Namibia, Niger, Tanzania, Uganda and Zambia, while the second subsample consists of 7 countries including Benin, Botswana, Ghana, Kenya, Mauritius, Senegal and South Africa. Table A8 in the appendix reproduces Columns (2) and (5) of Table 1 for each of the two subsamples. In the better solidarity sample the local firm dummy and its interaction with training programs become insignificant. This suggests that in these countries local firms may be less pressured to hire their relatives and may thus face similar hiring constraints as foreign firms. In contrast, in the worse solidarity sample, the domestic firm dummy or its interaction with Training remain significant and the training dummy becomes negative and significant.

Table 2—Explaining Total Sales per Employee

<table>
<thead>
<tr>
<th>Equations</th>
<th>Dependent Variable : Total Sales per Employee (log)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(1)</td>
</tr>
<tr>
<td>Constant</td>
<td>9.210***</td>
</tr>
<tr>
<td></td>
<td>(56.70)</td>
</tr>
<tr>
<td>Domestic firm</td>
<td>-0.334***</td>
</tr>
<tr>
<td></td>
<td>(6.53)</td>
</tr>
<tr>
<td>Firms’ characteristics</td>
<td></td>
</tr>
<tr>
<td>Age of the firm (log)</td>
<td>0.016</td>
</tr>
<tr>
<td></td>
<td>(0.67)</td>
</tr>
<tr>
<td>Location dummy</td>
<td>0.233***</td>
</tr>
<tr>
<td></td>
<td>(4.12)</td>
</tr>
<tr>
<td>Export dummy</td>
<td>0.251***</td>
</tr>
<tr>
<td></td>
<td>(3.79)</td>
</tr>
<tr>
<td>ISO certification</td>
<td>0.357***</td>
</tr>
<tr>
<td></td>
<td>(6.64)</td>
</tr>
<tr>
<td>Capital stock (log)</td>
<td>0.076***</td>
</tr>
<tr>
<td></td>
<td>(10.44)</td>
</tr>
<tr>
<td>Training programs</td>
<td>0.130***</td>
</tr>
<tr>
<td></td>
<td>(3.92)</td>
</tr>
<tr>
<td>Training x Domestic</td>
<td>-0.070</td>
</tr>
<tr>
<td></td>
<td>(0.76)</td>
</tr>
<tr>
<td>Workforce characteristics</td>
<td></td>
</tr>
<tr>
<td>Experience of the top manager (log)</td>
<td>-0.025</td>
</tr>
<tr>
<td></td>
<td>(1.12)</td>
</tr>
<tr>
<td>Unqualified workforce is a major constraint</td>
<td>0.078</td>
</tr>
<tr>
<td></td>
<td>(1.40)</td>
</tr>
<tr>
<td>Access to credit</td>
<td></td>
</tr>
<tr>
<td>Overdraft/Credit</td>
<td>0.304***</td>
</tr>
<tr>
<td></td>
<td>(5.28)</td>
</tr>
<tr>
<td>Overdraft x Domestic</td>
<td>-0.213**</td>
</tr>
<tr>
<td></td>
<td>(2.31)</td>
</tr>
<tr>
<td>Credit is a major constraint</td>
<td>-0.236***</td>
</tr>
<tr>
<td></td>
<td>(3.29)</td>
</tr>
<tr>
<td>Working capital is</td>
<td>-0.018</td>
</tr>
<tr>
<td>100% internal</td>
<td>(0.41)</td>
</tr>
<tr>
<td>Observations</td>
<td>4,661</td>
</tr>
<tr>
<td>R-squared</td>
<td>0.810</td>
</tr>
</tbody>
</table>

OLS Method, Standard errors are clustered at the country / industry level. Absolute value of robust t-ratios in parentheses. * significant at 10%; ** significant at 5%; *** significant at 1%

According to the theory, labor productivity should be smaller in local firms. The difference in labor productivity between local and foreign firms is assessed in Table 2 where the dependant variable is the total sales per employee. The results show that sales per employee in local firms are
on average significantly lower than in foreign firms, by a percentage ranging from 21% to 35%. Although sales data are a better measure of productivity than profit data as it is subject to less measurement errors, we also run the regressions with profit per employee and the results are robust (they are available from the authors). It is worth noting that the impact of having overdraft or credit facilities is significantly smaller for local firms (by roughly 20%, see Columns (4) and (5)). In other words, local firms are structurally less productive than foreign ones, even when they have access to credit.\textsuperscript{13} Table A9 in the appendix presents the results obtained by running the labor productivity regressions separately for the better and the worse institutional solidarity samples. The labor productivity of domestic firms is smaller in the worse institutional solidarity sample. Likewise, the gap between foreign firms and local firms with access to credit and overdraft facilities disappears in the better ISI sample while it remains pending and important in the worse solidarity sample (see the interaction of Overdraft and Domestic dummies in Columns (2) and (4), Table A9).

The above results suggest that local firms operating in countries with poor/no social protection are structurally less productive than foreign ones, even when we control for credit constraints and other observable factors. This difference between local and foreign firms productivity is however less pronounced in countries with better social protection. The local firms’ challenge is therefore not only to gain a better access to the credit market but also to manage the social redistributive pressure and the related poorly qualified hired workers.

III. Structural Estimation: How Many Entrepreneurs Are Missing?

The preceding section conveyed only one part of our story which was to analyze firms and agents behavior among those who are entrepreneurs. In this section, we focus on the other part of the story by taking into account those who decided not to become entrepreneurs, that is, wageworkers. The goal is to measure the impact of social pressures on individuals decision to become entrepreneurs. The structural estimation therefore uses data on workers employed in formal manufacturing firms. A nicety of the structural estimation of the model is that it allows us to compute the proportion of missing African entrepreneurs, that is, the proportion of individuals who would have chosen to become entrepreneurs if they were not subject to potential high family tax.

A. Estimation Procedure

Our structural estimation proceeds as follows. We start by making a parametric assumption over the distribution of talent. We then identify entrepreneurs versus wageworkers in our sample and use the distributional assumption of talent to provide estimates of our theoretical model. The estimation of missing entrepreneurs then follows by computing the gap between threshold ability levels required to become entrepreneurs for foreigners and locals.

Since the entrepreneurial talent \( \theta \) is not observable by the econometrician we make a structural assumption on its distribution in order to estimate the model. Formally, we assume that the entrepreneurial ability is correlated with education and experience. However, we allow these correlations to differ between locals and foreigners to account for the possible differences in the quality of education or experience across the two types. Let \( d_i \) denotes a dummy variable such that \( d_i = 1 \)

\textsuperscript{13}Unreported regressions (available from the authors) using the proportion of production workers as the dependent variable also confirm that local firms are more labor intensive and use training to deal with their unqualified blue collars.
if individual $i$ is of local origin and $d_i = 0$ if $i$ is a foreigner. The ability equation is specified by:

$$(19) \quad \ln \theta_i = \begin{cases} \delta_{0l} + \delta_{1l}s_i + \delta_{2l}x_i + \epsilon_{il} & \text{for } d_i = 1 \\ \delta_{0f} + \delta_{1f}s_i + \delta_{2f}x_i + \epsilon_{if} & \text{for } d_i = 0 \end{cases}$$

where $s_i = \ln(1 + S_i)$ and $x_i = \ln(1 + X_i)$ are the logs of years of education and years of experience of agent $i$, respectively. The error terms $\epsilon_{il}$ and $\epsilon_{if}$ are assumed to be normally distributed, with mean 0 and variances $\sigma^2_l$ and $\sigma^2_f$, respectively. Log-linear specification of the talent distribution has also been considered by Evans & Jovanovic (1989), and Paulson, Townsend & Karaivanov (2006). In Appendix A.A2 we relax the normality assumption to allow for unknown distributions of the error terms (i.e., semiparametric estimation). This permits to check the robustness of the results obtained from the normality assumption. The above specification of ability allows the distribution of talent of locals to be qualitatively different from foreigners’. We are therefore able to capture differences in variances and elasticities that may exist across the two types of agents.

The allocation of agents between entrepreneurship ($E_i = 1$) and wage-work ($E_i = 0$) can be modeled by

$$E_i = \begin{cases} 1\{\theta_i \geq \theta_{il}\} & \text{for } d_i = 1 \\ 1\{\theta_i \geq \theta_{if}\} & \text{for } d_i = 0 \end{cases}$$

where $1\{\cdot\}$ is the indicator function that equals 1 if its argument is true and 0 otherwise. The critical ability thresholds $\theta_{il}$ and $\theta_{if}$ that determine entrepreneurial decision for foreigners and locals are those given by equations (8) and (16), respectively. The probability of becoming an entrepreneur in the economy is given by

$$\Pr[E_i = 1|d_i] = (1 - d_i) \Pr[\theta_i \geq \theta_{if}] + d_i \Pr[\theta_i \geq \theta_{il}]$$

$$= (1 - d_i) \Pr[\ln \theta_i \geq \ln \theta_{if}] + d_i \Pr[\ln \theta_i \geq \ln \theta_{il}]$$

(20)

Denote by $K_i$ the amount of capital used by the agent. Because agent $i$ is not necessarily an entrepreneur, this variable is not observed for all individuals. We therefore need to construct a suitable measure for the agent’s capital or potential capital. We use two approaches: the first, which is presented in the main text, is to exogenously fix the capital of agent $i$ to be the sample mean of the capital used by the firms in the country in which agent $i$ operates.\footnote{The capital of a firm is calculated as the three-years average of the total annual investment of this firm. A better proxy would be the yearly book value of the firm, but very few firms reported this amount.} Agents operating in the same country therefore face the same amount of capital. This way, estimated variations in decisions can be interpreted as due to other conditions than capital constraints. The second approach, which is presented in Appendix A.A2, is to take $K_i$ as the actual capital of the firm if the agent $i$ is an entrepreneur. If agent $i$ is a wageworker, $K_i$ is taken to be his total labor income (including salary, allowances and benefits) topped up with the amount he would be willing to pay for an HIV test.\footnote{A better proxy would have been their total wealth including savings and other belongings, but our data are drawn from enterprise surveys rather than household surveys and therefore do not contain this information. However, since income is likely related to savings and the amount the worker is willing to pay for a HIV test is likely correlated with their wealth, this variable gives information that reasonably differentiate workers in their capacity of obtaining capital for their business venture.} The vector $[1, s_i, x_i, K_i, w_i, r_i, \cdot]$ is the vector of observable characteristics of agent $i$, where $w_i$ and $r_i$ are the average wage and borrowing interest rate in the commercial banks observed in the country in which agent $i$ operates.\footnote{These rates are available on the countries central bank websites.}
From Equations (8) and (16), the expressions of $\ln \theta_{lf}$ and $\ln \theta_{il}$ for agent $i$ are given by

$$
\ln \theta_{lf} = \alpha \ln \left( \frac{w_i}{K_i} + r_i \right) - \alpha \ln \alpha - (1 - \alpha) \ln(1 - \alpha) + (1 - \alpha) \ln w_i
$$

(21)

$$
\ln \theta_{il} = \alpha \ln \left( \frac{w_i}{K_i} + r_i + \frac{(1 - \beta)T_i}{K_i} \right) - \alpha \ln \alpha - (1 - \alpha) \ln(1 - \alpha) + (1 - \alpha) \ln w_i.
$$

(22)

The available data do not contain information about the family tax, $T_i$, imposed on agent $i$. However, Equation (15) from the theoretical model indicates that $\Pi^f(\theta_i) - \Pi^l(\theta_i) = (1 - \beta)T_i$. This suggests that we can approximate $(1 - \beta)T_i$ with $\Delta\Pi_i$, the average difference of profits between foreign and local firms in the country in which agent $i$ operates. Denote by $Z_i = [1, S_i, X_i, K_i, w_i, r_i, d_i, \Delta\Pi_i]'$ the vector of observable data relative to agent $i$. Using the specification (19) in Equation (20) we then have

$$
\Pr[E_i = 1|Z_i] = (1 - d_i)\Phi \left( \frac{\delta_{0f} + \delta_{1f} s_i + \delta_{2f} x_i - \ln \theta_{lf}}{\sigma_f} \right) + d_i \Phi \left( \frac{\delta_{1l} + \delta_{1l} s_i + \delta_{2l} x_i - \ln \theta_{il}}{\sigma_l} \right)
$$

(23)

$$
= H(Z_i, \psi),
$$

where $\ln \theta_{lf}$ is given by Equation (21), $\ln \theta_{il}$ is given by Equation (22) with $\Delta\Pi_i$ in lieu of $(1 - \beta)T_i$, and $\Phi(\cdot)$ is the cumulative density function (CDF) of the standard normal. The choice function $H(Z_i, \psi)$ has the form of a convex combination of two gaussian distributions, as commonly encountered in mixture probability models. The vector of structural parameters of interest is given by $\psi = [\delta_{0f}, \delta_{1f}, \delta_{2f}, \sigma_f, \delta_{0l}, \delta_{1l}, \delta_{2l}, \sigma_l, \alpha]'$.

Given a random sample of observations of size $n$, $\{(E_i, Z_i), i = 1, \ldots, n\}$, the sample log-likelihood function of the econometric model can therefore be written as:

$$
L_n(\psi) = \sum_{i=1}^{n} \left[ E_i \ln H(Z_i, \psi) + (1 - E_i) \ln(1 - H(Z_i, \psi)) \right].
$$

(24)

The maximum likelihood estimation is performed by numerically maximizing (24) with respect to the set of parameters $\psi = [\delta_{0f}, \delta_{1f}, \delta_{2f}, \sigma_f, \delta_{0l}, \delta_{1l}, \delta_{2l}, \sigma_l, \alpha]'$. These parameters correspond to the constant term of the ability distribution, $\delta_{0j}$; the interaction between education and ability, $\delta_{1j}$; the interaction between experience and ability, $\delta_{2j}$; the standard deviation of the ability distribution, $\sigma_j$; and the productivity of capital in the production technology, $\alpha$, where $j = f, l$.

A procedure to estimate the proportion of missing local African entrepreneurs can be readily derived from this setup. Our theoretical model predicts that a local wageworker $i$ whose ability $\theta_i$ belongs to $[\theta_{lf}, \theta_{il}]$ is a missing local entrepreneur (i.e., this individual is talented enough to become an entrepreneur but prefers to work as wageworker because of potential social redistributive pressures otherwise). The probability that the ability $\theta_i$ of a local wageworker $i$ belongs to $[\theta_{lf}, \theta_{il}]$

Note that unlike in the standard probit models, the variance parameters $\sigma_f$ and $\sigma_l$ are identified here because of the nonlinearity of the model in $\alpha$. 18
is given by

\[ m_i(\psi) = \Pr [\theta_l \leq \theta_i \leq \theta_d | d_i = 1] = \left[ \Phi \left( \frac{\delta_0 l + \delta_1 s_i + \delta_2 x_i - \ln \theta_l}{\sigma_l} \right) - \Phi \left( \frac{\delta_0 l + \delta_1 s_i + \delta_2 x_i - \ln \theta_d}{\sigma_l} \right) \right]. \tag{25} \]

From this equation the proportion of missing entrepreneurs in the sample of local wageworkers is estimated as

\[ \hat{m} = \frac{\sum_{i=1}^{n} m_i(\hat{\psi})(1 - E_i)d_i}{\sum_{i=1}^{n} (1 - E_i)d_i} \]

where \( m_i(\hat{\psi}) \) is obtained from (25) by plugging-in the parameter estimates \( \hat{\psi} \). Equation (26) therefore gives the fraction of local wageworkers who have enough talent to become entrepreneurs but are discouraged to start a business because of high family taxation.

**B. Estimation Results**

The data used to estimate our structural parameters come from the same Enterprise Survey data described in Section II. However, we focus on data regarding Employees Questionnaires as they contain information about both employers and employees in each firm. For these questionnaires up to ten employees per firm, distributed across all various typical functions inside the firm, were surveyed. The survey provides information about workers age, position in the company, experience and qualifications, education, wage/salary and allowances, etc. Because of many missing data and outliers in the Employees Questionnaires the data are checked and matched with each firm individually. Our final dataset contains a sample of 9,309 observations from workers of the formal manufacturing sector of ten African countries: Benin, Kenya, Mauritius and Senegal, whose institutional solidarity index is above the sample median (i.e., better solidarity index group) and Ethiopia, Madagascar, Mali, Tanzania, and Uganda, whose institutional solidarity index is below the sample median (i.e., worse solidarity index group). Data for Eritrea are also available, however their ISI index is not. Based on AfDB et al. (2012) we classified Eritrea in the worse solidarity index group.\(^{18}\)

The descriptive statistics of variables used in the structural estimation are presented in Table 3. In our sample, the proportion of people working in local firms is 50.5% in the whole sample. This proportion is higher in the worse ISI sample than in the better ISI sample (55% against 44.9%). On the other hand, the average monthly wage in the former ($90.64) is significantly lower than in the latter ($128.49). As one would expect, the average difference in profit between foreign firms and local firms is higher in countries with worse ISI at about $72,485 relative to countries with better ISI where it is about $26,678. This difference is more than twice bigger in worse ISI countries compared to better ISI ones. Since these amounts are proportional to the tax imposed to entrepreneurs by their families and relatives, it suggests that family liability within worse ISI countries must be significantly higher than within countries with better ISI. The interest rate faced by each entrepreneur is the average observed interest rate in the country where they operate. The borrowing rate in the whole sample is 17.1% with 12.9% for the better solidarity sample and 20.4% for the worse solidarity sample.

\(^{18}\)According to the African Economic Outlook 2012, published by the African Development Bank (http://www.afdb.org) “Social safety nets remain based on extended family networks and are steeped in customary law” in Eritrea.
### Table 3—Descriptive Statistics of variables used in the Structural Estimation

<table>
<thead>
<tr>
<th>Variables</th>
<th>Whole Sample</th>
<th>Better ISI</th>
<th>Worse ISI</th>
</tr>
</thead>
<tbody>
<tr>
<td>n</td>
<td>Sample size</td>
<td>9,309</td>
<td>4,205</td>
</tr>
</tbody>
</table>

**Individual characteristics**

| E         | Equals 1 if Entrepreneur, 0 otherwise | 0.0870 (0.3181) | 0.0832 (0.3041) | 0.0901 (0.3336) |
| S         | Years of education | 10.9352 (5.2187) | 10.7170 (5.1763) | 11.1150 (5.2470) |
| X         | Years of work experience | 6.4331 (6.5044) | 6.8114 (6.9036) | 5.9821 (6.0605) |
| K         | Amount of capital (in US dollars) | 11,411 (30,225) | 14,581 (20,2120) | 13,697 (36,466) |
| d         | Equals 1 if local, 0 if foreigner | 0.5046 (0.0051) | 0.4492 (0.0076) | 0.5502 (0.0069) |

**Country specific characteristics (averages)**

| ΔΠ       | Avg. Diff. of profits foreign vs local ($) | 40,947 (9,123) | 26,678 (2,148) | 72,485 (11,392) |
| w        | Wage (monthly, in US dollars) | 108.287 (57.286) | 128.4925 (64.7447) | 90.6400 (43.8047) |
| r        | Gross interest rate | 1.1710 (0.0546) | 1.1298 (0.0338) | 1.2039 (0.0450) |

In fact, we do not observe the nationality/origin of the workers, but just the nationality/origin of the firms for which they work. This would not be an important issue for our estimation if the talent distribution of foreigners and locals were the same. However, the assumption of common distribution is rejected by our base case estimates, which show that people working in foreign and local firms are not drawn from the same distribution of talent (see Table 4). Because of selection to immigration, foreigners who chose to migrate and start a business abroad might be different from the local population. We thus consider that foreign and local people are drawn from possibly different distributions of talent. The problem then is to allocate individuals between “local” and “foreign”. We make the assumption that workers in a local firm are locals and that workers in a foreign firm are foreigners. This assumption is reasonable for the local firms as they recruit essentially through family network, and are thus populated with local workers. But it is less accurate for foreign firms that recruit more through formal means and have presumably on board both types of workers (i.e., foreigners and locals). It implies that we count as foreigner possibly local people. Since these locals have been able to find a job in a foreign firm, they are presumably different (i.e. better) than those who need to rely on their network of relatives for help. In particular, some of them might be talented enough to become entrepreneurs, but have chosen to work as wageworkers to avoid the burden of supporting their extended family. Our estimations neglect those individuals by treating them as wageworkers of foreign origin. We thus over-estimate the talent threshold above which a foreigner becomes an entrepreneur and by the same token under-estimate the percentage of missing local entrepreneurs (i.e., we under-estimate the gap \( \theta_l - \theta_f \) for locals).\(^{19}\)

\(^{19}\)Unreported structural estimations obtained by assuming a common talent distribution for foreigners and locals show that the percentage of missing entrepreneurs is indeed higher. However this assumption is rejected by our base case estimates given in Table 4.
Table 4 presents the maximum likelihood estimation results of the theoretical model parameters for our sample, where the capital has been exogenously fixed to be the sample mean of the capital used by firms in the country in which each individuals operate. We report estimates for the whole sample, for the better solidarity sample (consisting of Benin, Kenya, Mauritius and Senegal) and for the worse solidarity sample (consisting Eritrea, Ethiopia, Madagascar, Mali, Tanzania, and Uganda). We also provide $P$-values for the comparison of estimates between better and worse stratifications (see last column of the table). All the structural estimators produce reasonable parameter values that are significant at 1%. The constant terms of the logarithm talent $\delta_0_f$ and $\delta_0_l$ are estimated at 6.5 for foreigners and 6.8 for locals in our whole sample and are both lower for the better solidarity sample compared to the worse solidarity one. This parameter represents the average natural talent of individuals, that is, their minimum average talent regardless of their education and experience.

The correlation between talent and years of schooling as captured by $\delta_1_f$ and $\delta_1_l$ are estimated at 0.32 and 0.30 respectively. This means that each percentage increases in years of schooling is associated with a 0.32% increase in average talent for foreigners and a 0.30% increase of average talent for locals. The parameters that relate years of work experience to entrepreneurial talent, $\delta_2_f$ and $\delta_2_l$, are also estimated to be 0.21 and 0.19 respectively, in the whole sample. Each percentage increases in years of work experience is associated with a 0.21% increase in average entrepreneurial talent for foreigners and 0.19% for locals. These estimates show that education tends to have larger effect on entrepreneurial ability compared to professional experience. However, the relationships between education, experience and talent are not necessarily uniform across ISI stratifications. The elasticities of education and experience on talent tend to be lower in countries with worse institutional solidarity index than in countries with better one, and the difference between estimates across these stratifications is strongly significant. In other words, everything else being equal, individuals in countries with worse institutional solidarity need to accumulate more years of education and experience to be able to catch up with those from better solidarity countries. The parameter $\alpha$ is estimated to be 0.22 for the whole sample. This means that a 10% increase in business investment would be associated with a 2.2% increase in output. This estimate of $\alpha$ is smaller than those usually obtained for the informal economy (see Grimm et al. 2011, Kremer et al 2010, Udry and Anagol 2006, Nguimkeu 2014). This suggests that businesses in the formal sector operate at a higher scale with low marginal returns though they face some degree of financial constraints as well. This parameter tends to be significantly higher for worse solidarity countries compared to better solidarity countries. Finally, standard deviations for ability, $\sigma_f$ and $\sigma_l$, are larger in the better solidity sample compared to worse solidity sample. This is presumably due to the fact that a better institutional environment attracts a larger variety of talented individuals than a worse institutional environment.

Using the estimated structural parameters, we calculate $m$, the fraction of the local population that has values of $\theta$ and of other characteristics satisfying the conditions of Proposition 1 and 3, yet prefer wage-work to entrepreneurship because of the social redistributive pressure that the latter occupation implies. This fraction of the local population is the proportion of missing African entrepreneurs and our model predicts that they represent about 7.2% of the overall local workforce in the formal manufacturing sector. This proportion is even higher in countries with worse institutional solidarity environment and the difference in the loss of entrepreneurs across the two stratifications is significant. This finding is consistent with our theoretical model and descriptive statistics and further testifies that better social safety nets may encourage entrepreneurship in Africa by relaxing social obligations. It is important to note that the fraction of missing en-
Table 4—Structural Maximum Likelihood Estimates of the Model

<table>
<thead>
<tr>
<th>Type</th>
<th>Parameter</th>
<th>Name</th>
<th>Whole sample</th>
<th>Better sample</th>
<th>Worse sample</th>
<th>Difference</th>
<th>Pvalue</th>
</tr>
</thead>
<tbody>
<tr>
<td>Foreigners</td>
<td>Log ability - constant</td>
<td>$\delta_{0f}$</td>
<td>6.5010</td>
<td>5.9231</td>
<td>6.7200</td>
<td>0.0000</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(0.0004)</td>
<td>(0.0006)</td>
<td>(0.0015)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Log ability - education</td>
<td>$\delta_{1f}$</td>
<td>0.3215</td>
<td>0.4153</td>
<td>0.2788</td>
<td>0.0000</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(0.0005)</td>
<td>(0.0003)</td>
<td>(0.0042)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Log ability - experience</td>
<td>$\delta_{2f}$</td>
<td>0.2112</td>
<td>0.3820</td>
<td>0.1849</td>
<td>0.0000</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(0.0131)</td>
<td>(0.0002)</td>
<td>(0.0041)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Stand. dev. for ability</td>
<td>$\sigma_f$</td>
<td>0.4530</td>
<td>0.7238</td>
<td>0.3163</td>
<td>0.0000</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(0.0012)</td>
<td>(0.0002)</td>
<td>(0.0059)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Locals</td>
<td>Log ability - constant</td>
<td>$\delta_{0l}$</td>
<td>6.8190</td>
<td>5.3130</td>
<td>7.065</td>
<td>0.0000</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(0.0002)</td>
<td>(0.0006)</td>
<td>(0.0012)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Log ability - education</td>
<td>$\delta_{1l}$</td>
<td>0.3020</td>
<td>0.3908</td>
<td>0.2021</td>
<td>0.0000</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(0.0002)</td>
<td>(0.0004)</td>
<td>(0.0022)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Log ability - experience</td>
<td>$\delta_{2l}$</td>
<td>0.1912</td>
<td>0.3013</td>
<td>0.1445</td>
<td>0.0000</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(0.0139)</td>
<td>(0.0002)</td>
<td>(0.0018)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Stand. dev. for ability</td>
<td>$\sigma_l$</td>
<td>0.3891</td>
<td>0.6901</td>
<td>0.1283</td>
<td>0.0000</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(0.0011)</td>
<td>(0.0009)</td>
<td>(0.0052)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>All</td>
<td>Capital returns</td>
<td>$\alpha$</td>
<td>0.2150</td>
<td>0.1810</td>
<td>0.3915</td>
<td>0.0090</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(0.0024)</td>
<td>(0.0017)</td>
<td>(0.0187)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Log-likelihood</td>
<td>$\text{-lnL}$</td>
<td>-4,852</td>
<td>-2,365.6</td>
<td>-2,495.4</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Number of Obs.</td>
<td>$n$</td>
<td>9,309</td>
<td>4,205</td>
<td>5,104</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Frac. missing entrep.</td>
<td>$m$</td>
<td>0.0718</td>
<td>0.0689</td>
<td>0.0782</td>
<td>0.0000</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(0.0041)</td>
<td>(0.0052)</td>
<td>(0.0069)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Standard errors in parenthesis

entrepreneurs obtained is an underestimated proportion of the overall missingness. In fact, it only estimates the proportion of formal wageworkers who are not willing to become entrepreneurs in spite of having good entrepreneurial abilities. It does not include, for example, informal wageworkers who have the potential of becoming formal entrepreneurs but are not willing to do so because of the underlying family liability.

C. Robustness Checks

We carried out several other estimations with various specifications, all of which remained consistent with our base case estimates (see the appendix for more details). First, when we assume that the talent distribution is the same for foreigners and for locals, the fraction of missing entrepreneurs is estimated to be 11.6% for the whole sample (9.1% for the better ISI sample and 13.9% for the worse one). It is larger than in our base case, which is expected as our base case tends to under-estimate the percentage of missing entrepreneurs by assuming that all the workers in foreign firms are foreigners. We do not present these results here because our base case results show that the ability distributions of workers in foreign firms is statistically different from the locals. Thus, a model with common distribution (which is in fact a special case of the model with separate distributions) is necessarily restrictive and misspecified as an equality test across the coefficients from the two respective types is rejected by the data.

Second, the estimation results presented in Table A10 are those for which capital is measured by the actual capital of the agent if he is an entrepreneur, and by his total labour income topped up
with the amount he would be willing to pay for an HIV test if he is a wageworker. The estimations obtained from this second approach yield a fraction of missing entrepreneurs of 7.7%. This fraction of missing entrepreneurs is also bigger than the one obtain in our base case of Table 4. This difference can be understood as follows: in the base case all individuals are assumed to have access to the same amount of capital which understates the level of financial constraints faced by wage-workers, whereas in practice the constraints they face are twofold: capital and labor. So in the first case barriers to entrepreneurship can only be attributed to family tax, whereas in the second case additional credit constraints are taken into account. Since we do not observe the stock of capital that would be available to a wageworker if he was willing to start his own business, we proxy it as described above. This proxy is an under-estimation of the capital available to a worker as it does not include his borrowing capacity, nor the assets and savings he might own which are unavailable in the data. By overstating the constraint faced by wageworkers in the capital market this method gives us a higher bound for the fraction of missing entrepreneurs due to the redistributive pressure (since Equation (17) implies that the gap \(\theta_l - \theta_f\) decreases with \(K\)).

Third, we provide semiparametric results where the normality assumption for individual talent is relaxed. In examining these results, presented in Tables A11 and A12 of Appendix A.A2, the following facts are notable. Overall, the results from the parametric and semiparametric approaches are comparable. The signs, sizes and significance levels of both estimates are similar. This suggests that the normal parametrization assumed earlier is not strongly at odds with the data. However, capital returns are much more smaller in the semiparametric approach than in the parametric approach, and the difference between the better and worse sample values is now significant only at the 10% level for the varying capital case (see Table A12). The fraction of missing entrepreneurs obtained in the semiparametric estimation ranges between 8% and 9% of the local formal workforce.

Finally, we modify the definition of “local firms” and consider as “local” a firm for which one of the principal owners is of African origin.\(^{20}\) The results are presented in Tables A13 and A14 in Appendix A. These results give a fraction of missing entrepreneurs of about 13%. This proportion is, as expected, higher than our base case results since it considers as “locals” both entirely domestically owned firms as well as firms that are partially owned by foreigners, provided at least one of the principal owners is African. Moreover, there is a big contrast between the fraction obtained for the better sample compared to the worse sample. In particular, while the fraction of missing entrepreneurs in the better sample is quite stable, it drastically rises for the worse sample. Part of this can be explained by the fact that in worse ISI countries, firms entirely owned by foreigners are extremely more profitable than other firms, while in better ISI countries, the profit gap between those firms and those partially owned by locals is moderate.

All these results show that regardless of the definition of local and foreign status, the definition of capital or the distributional assumption imposed on individual ability, local workers have a lower incentive to become entrepreneurs compared to foreign workers. Our findings suggest that this disincentive cannot be attributed to credit constraints alone - as advocated by many related studies - but might also be the result of social redistributive pressure on wealth as argued in our theory.

\(^{20}\)Although the questionnaire doesn’t ask for individual country of origin, there are in some countries questions related to the origin (i.e., African, Asian, European, etc) of the principal owners of the firm. “African origin” does not necessarily mean that the principal owner is local. There are indeed a lot of internal migration in Africa.
D. Discussion, Implications and Limitations

Our structural estimates are a suggestive insight of what a more refined research using more thorough information and less stringent functional forms assumptions may reveal. Yet the results obtained are striking. While none of parametric or semiparametric findings presented here is definitive on its own, taken together they reinforce the theoretical model predictions that forced mutual help is a significant barrier to entrepreneurship. The fraction of missing entrepreneurs obtained in this framework represents an important amount of implied wealth and an even higher proportion of implied jobs. These missing formal enterprises represent a gap in the formal productive sector and in tax revenues that could be used to improve social safety nets and lower the need for mutual help.

Our findings also help explain the puzzling result that very small firms in developing countries exhibit extremely high returns on capital (Banerjee and Duflo, 2014; De Mel et al. 2008). The non-monotonicity of capital returns according to firms size is usually explained by inefficient financial markets. This paper suggests that in the African context the excessive returns may also be the result of additional labor market constraints. Talented entrepreneurs may prefer to keep running smaller informal firms because growing toward bigger formal ones may imply facing a higher taxation from their extended network of relatives. Combined with tight credit constraints it helps explain the excessive returns on their small firms.

Finally, the analysis sheds a new light on social protection. It implies that social protection does not only provide social benefits, but it also leads to economic efficiency, and explains why it is currently being developed in emerging economies (Barrientos 2013). Social security, public retirement plans, and other public schemes aimed at protecting the unemployed, the sick, the children or the elderly allow workers and firms to disconnect their investment, savings and managerial decisions from family protection. Since the formal sector represents about 60% of the GDP in Sub-Saharan Africa (Schneider 2005), our structural results imply that the mutual help constraint generates a shortfall of about 3.8% - 7.1% of GDP in Sub-Saharan Africa. On the other hand, the International Labor Organization estimated that a universal basic child benefit scheme in Sub-Saharan Africa would cost between 1.7% and 3.4% of GDP, a universal basic old age pension scheme would cost between 0.7% and 1.3% of GDP, and an employment guarantee scheme covering 10% of the working age population would cost between 0.4% and 0.7% of GDP (see ILO 2010). This represents a total cost of 2.8%-5.1% of GDP in social protection, an amount lower than the associated benefit implied by our structural estimates. Thus moving from the current equilibrium of laissez-faire to an equilibrium with a minimum protection is possible and overall beneficial.

Our results are limited in several respects. First, as explained throughout the empirical part of the paper, some useful information are not available in the data. The origin/nationality of each individual is not directly available nor is their full borrowing potential. Also, the extent of the family tax can not be calculated individually for each agent separately, but only as a countrywide average tax. Therefore, only the lower bound of the fraction of missing entrepreneurs, given by our base case results, is correctly estimated. Nonetheless, this lower bound is sufficiently high to suggest that more attention needs to be given to this phenomenon which is an important barrier to growth, so that relevant policy can be investigated.
IV. Conclusion

This paper argues that the social redistributive norm prevailing in Sub-Saharan Africa whereby wealthy individuals have the social obligation to share their resources with their relatives and extended family is detrimental to the continent economic growth. Since becoming an entrepreneur sends a signal of economic success, it inevitably involves a substantial family taxation and therefore discourages many local talented people to engage in such occupation. We identify the impact of the phenomenon by distinguishing between local entrepreneurs, who are subject to this social norm, and entrepreneurs of foreign origin, who are not. We show through structural parametric and semi-parametric estimation of our theoretical model of entrepreneurial choice that the forced mutual help constraint precludes between 7% and 13% of African wageworkers to become entrepreneurs in the formal sector. Local entrepreneurs are therefore constrained both on the credit market and on the labor market as well. In contrast, foreigners have a competitive hedge as they do not suffer from the same labor distortions. The resulting productivity gap helps explain the over-representation of minority entrepreneurs in the region, like the Indians in East Africa, the Lebanese and Syrians in West Africa, and Europeans in Southern Africa.

Our analysis also suggests that while social security, public retirement plans and other public schemes aimed at protecting the unemployed, the sick and the elderly play a redistributive function, they also play an important role in preventing inefficient allocation of labor in firms and skills across occupations. The lack of such public mechanisms in Sub-Saharan Africa appears to be very distortive. By eroding the local firms productivity, the forced mutual help norm constitutes an additional barrier to entrepreneurship and growth. Further research on compensation policies aiming to reduce extended family liability on economic activity in Africa is therefore needed.

REFERENCES


Barrientos, A., (2013), Social Assistance in Developing Countries, Cambridge University Press


Appendix

A1. Data Sources and Questionnaire Description

The data used in the empirical analysis come from two sources:

- The Institutional Profiles Database maintained by the Research Center in International Economics (CEPII) available at: http://www.cepii.fr/anglaisgraph/bdd/institutions.htm

The standard Enterprise Survey questionnaire comprises three parts:
A2. Semiparametric Estimation of the Model

In this estimation we allow the distributions of the error terms $\epsilon_i$ and $\epsilon_i$ in the talent distribution given by Equation (19) to be unknown. Because the constant terms are generally not identified in the semiparametric single-index estimation, we shift them into the error terms so that the unknown distribution of interest is a mixture of $\epsilon_i + \gamma_0$ and $\epsilon_i + \gamma_0$. The remaining parameters of the model are identified up to a scaling constant. Denote by $d_i$ the dummy variable for locals. We can write the ability equation as

$$\ln \theta_i = \delta_1 s_i + \gamma_1 s_i \times d_i + \delta_2 x_i + \gamma_2 x_i \times d_i + \epsilon_i$$

where $\epsilon_i$ is an unknown i.i.d error term. We denote by $\Psi$ the common CDF of $-\epsilon_i$.

Since $E_i = 1(\ln \theta_i > (1 - d_i) \ln \theta_i + d_i \ln \theta_d)$, we then have a version of Equation (23) rewritten as:

$$\Pr[E_i = 1|Z_i] = \Psi \left\{ \delta_1 s_i + \gamma_1 s_i \times d_i + \delta_2 x_i + \gamma_2 x_i \times d_i - (1 - \alpha) \ln w_i - \alpha \left[ (1 - d_i) \times \ln \left( \frac{w_i}{K_i} + r_i \right) + d_i \times \ln \left( \frac{w_i}{K_i} + r_i + \frac{\Delta \Pi_i}{K_i} \right) \right] \right\}$$

(A1)

$$= \Psi \left\{ \tilde{Z}_i \delta \right\}$$

where we have adopted the following notations for the simplicity of the exposition: $\delta = (\delta_1, \gamma_1, \delta_2, \gamma_2, -(1 - \alpha), -\alpha)$ and $\tilde{Z}_i = (s_i, s_i \times d_i, x_i, x_i \times d_i, \ln w_i, \Delta_i)'$, with $\Delta_i = (1 - d_i) \times \ln \left( \frac{w_i}{K_i} + r_i \right) + d_i \times \ln \left( \frac{w_i}{K_i} + r_i + \frac{\Delta \Pi_i}{K_i} \right)$.

Because we do not specify variances for the distributions of talent, our structural parameter vector of interest is now $\psi_S = [\delta_1, \gamma_1, \delta_2, \gamma_2, \alpha]'$. The parameters related to foreigners and locals are then retrieved by taking $\delta_{if} = \delta_i$, $i = 1, 2$ and $\delta_{il} = \delta_i + \gamma_i$, $i = 1, 2$, respectively. To estimate $\psi_S$ in this model, we use the semiparametric likelihood approach proposed by Klein and Spady (1993). Given $\Psi(\cdot)$, the log-likelihood function is

$$L_n(\psi_S, \Psi) = \frac{1}{n} \sum_{i=1}^{n} \left[ E_i \ln[\Psi(\tilde{Z}_i \delta)] + (1 - E_i) \ln[1 - \Psi(\tilde{Z}_i \delta)] \right].$$

(A2)

Since $\Psi$ is unknown, we follow Klein and Spady (1993) by replacing $\Psi$ in the above formula by a nonparametric estimator $\hat{\Psi}$. Noticing that $\mathbb{E}[E_i|Z_i] = \Psi \{ \tilde{Z}_i \delta \}$, the leave-one-out kernel estimator
of $\Psi$ is defined by (see, e.g., Li and Racine, 2007, p. 253)

$$\hat{\Psi}(\tilde{Z}_i^\prime \delta) = \frac{\sum_{j \neq i} E_j G \left( (\tilde{Z}_i - \tilde{Z}_j)^\prime \delta / h_n \right)}{\sum_{j \neq i} G \left( (\tilde{Z}_i - \tilde{Z}_j)^\prime \delta / h_n \right)}$$

where $G(\cdot)$ is the gaussian kernel function, and $h_n$ is a user-chosen bandwidth parameter that converges to zero. Substituting $\Psi$ by $\hat{\Psi}$ in equation (A2) leads to the feasible likelihood criterion

$$L_n(\psi_S) = \frac{1}{n} \sum_{i=1}^{n} \left[ E_i \ln \left( \hat{\Psi}(\tilde{Z}_i^\prime \delta) \right) + (1 - E_i) \ln \left( 1 - \hat{\Psi}(\tilde{Z}_i^\prime \delta) \right) \right].$$

Maximizing (A4) with respect to $\psi_S$ leads to a semiparametric maximum likelihood estimator, denoted $\hat{\psi}_S$. Maximization is performed numerically by solving the first order condition obtained from (A4). This includes using an extensive grid search for initial values of the parameter vector $\psi_S$, and introducing a trimming function to trimmed out extremely small values from the denominators in (A3). Standard errors (in parenthesis in the results table) are obtained by computing the sample counterpart of the asymptotic variance-covariance matrix of the structural parameters.

From the semiparametric estimator $\hat{\psi}_S$, we can compute the fraction of missing entrepreneurs as described in equations (25) and (26), where the semiparametric estimates are used in the formula, and the normal CDFs are replaced by the nonparametric CDFs. The results of the semiparametric estimation are presented in the Tables A11 and A12.

### A3. Estimation With a Redefinition of “Local Firm”

We check the robustness of our results by redefining as “local” a firm for which one of the principal owners is of African origin. In other words, these local firms are those that are either entirely domestically owned, or are partially owned by foreigners provided at least one of the principal owners is of African origin. This reduces the proportion of foreign firms from 0.49 to 0.27, and the average difference of profits between foreign and local firms moves from $40,947 to $44,696. This difference is even higher for the worse solidarity sample, $90,000 compared to the better solidarity sample, $37,000. Tables A13 and A14 present the structural estimations results.
### Table A1—Firm Ownership and Size

<table>
<thead>
<tr>
<th>Type</th>
<th>Domestic Firms (%)</th>
<th>Foreign Firms (%)</th>
<th>Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Largest shareholder/owner of the firm</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Individual/Family</td>
<td>97.88</td>
<td>80.57</td>
<td>-17.3***</td>
</tr>
<tr>
<td>Manager/Director</td>
<td>85.12</td>
<td>73.01</td>
<td>-12.11***</td>
</tr>
<tr>
<td>Female</td>
<td>11.65</td>
<td>12.59</td>
<td>0.94*</td>
</tr>
<tr>
<td>Domestic company</td>
<td>34.62</td>
<td>15.76</td>
<td>-18.85***</td>
</tr>
<tr>
<td>Foreign company</td>
<td>0.00</td>
<td>70.86</td>
<td>70.86***</td>
</tr>
<tr>
<td>Bank/Investment fund</td>
<td>1.35</td>
<td>3.23</td>
<td>1.87</td>
</tr>
<tr>
<td>Other</td>
<td>14.03</td>
<td>12.62</td>
<td>-1.41</td>
</tr>
<tr>
<td><strong>Size of the firm</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Small firms (&lt; 20)</td>
<td>55.25</td>
<td>23.53</td>
<td>-31.72***</td>
</tr>
<tr>
<td>Medium firms (20 – 100)</td>
<td>32.18</td>
<td>35.77</td>
<td>3.59**</td>
</tr>
<tr>
<td>Large firms (&gt; 100)</td>
<td>12.57</td>
<td>40.70</td>
<td>28.13***</td>
</tr>
</tbody>
</table>

### Table A2—Distribution of Firms by Industry according to Ownership

<table>
<thead>
<tr>
<th>Industries</th>
<th>Domestic Firms (%)</th>
<th>Foreign Firms (%)</th>
<th>Difference</th>
<th>Avg firm size</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wood and furniture</td>
<td>16.65</td>
<td>7.94</td>
<td>-8.71 ***</td>
<td>53</td>
</tr>
<tr>
<td>Food &amp; Beverages</td>
<td>15.48</td>
<td>15.46</td>
<td>-0.02</td>
<td>161</td>
</tr>
<tr>
<td>Other manufacturing</td>
<td>13.20</td>
<td>11.06</td>
<td>-2.14 **</td>
<td>67</td>
</tr>
<tr>
<td>Metals &amp; machinery</td>
<td>12.83</td>
<td>10.99</td>
<td>-1.84 *</td>
<td>105</td>
</tr>
<tr>
<td>Garments &amp; Leather</td>
<td>11.71</td>
<td>9.01</td>
<td>-2.70 **</td>
<td>121</td>
</tr>
<tr>
<td>Agroindustry</td>
<td>6.51</td>
<td>10.78</td>
<td>4.27 ***</td>
<td>95</td>
</tr>
<tr>
<td>Chemicals &amp; pharmaceutics</td>
<td>5.35</td>
<td>9.86</td>
<td>4.51 ***</td>
<td>86</td>
</tr>
<tr>
<td>Other unclassified</td>
<td>4.28</td>
<td>3.83</td>
<td>-0.45</td>
<td>61</td>
</tr>
<tr>
<td>Textiles</td>
<td>3.60</td>
<td>6.10</td>
<td>2.50 ***</td>
<td>281</td>
</tr>
<tr>
<td>Construction</td>
<td>3.55</td>
<td>5.18</td>
<td>1.63 ***</td>
<td>56</td>
</tr>
<tr>
<td>Non-metallic &amp; plastics</td>
<td>3.53</td>
<td>6.88</td>
<td>3.35***</td>
<td>99</td>
</tr>
<tr>
<td>Paper</td>
<td>2.39</td>
<td>2.06</td>
<td>-0.33</td>
<td>75</td>
</tr>
<tr>
<td>Electronics</td>
<td>0.68</td>
<td>0.43</td>
<td>-0.26</td>
<td>126</td>
</tr>
<tr>
<td>Mining &amp; quarrying</td>
<td>0.25</td>
<td>0.43</td>
<td>0.18</td>
<td>592</td>
</tr>
</tbody>
</table>
### Table A3—Credit and Overdraft Facilities

<table>
<thead>
<tr>
<th>Credit</th>
<th>Domestic Firms (%)</th>
<th>Foreign Firms (%)</th>
<th>Difference (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>% Firms with overdraft facility</td>
<td>39.48</td>
<td>57.60</td>
<td>18.11***</td>
</tr>
<tr>
<td>or Line of Credit</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Private commercial banks</td>
<td>82.07</td>
<td>87.13</td>
<td>5.06*</td>
</tr>
<tr>
<td>State-owned banks</td>
<td>9.43</td>
<td>4.95</td>
<td>-4.48**</td>
</tr>
<tr>
<td>Non-bank financial institutions</td>
<td>6.96</td>
<td>3.96</td>
<td>-2.99</td>
</tr>
<tr>
<td>Other</td>
<td>1.55</td>
<td>3.96</td>
<td>2.41**</td>
</tr>
<tr>
<td><strong>Applied for loans</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Collateralized</td>
<td>84.99</td>
<td>83.06</td>
<td>-1.92</td>
</tr>
<tr>
<td>Types of collateral</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Land</td>
<td>57.19</td>
<td>61.76</td>
<td>4.58</td>
</tr>
<tr>
<td>Machinery</td>
<td>44.44</td>
<td>59.22</td>
<td>14.78***</td>
</tr>
<tr>
<td>Intangible assets</td>
<td>24.32</td>
<td>25.49</td>
<td>1.17</td>
</tr>
<tr>
<td>Personal assets</td>
<td>36.04</td>
<td>24.27</td>
<td>-11.76**</td>
</tr>
<tr>
<td><strong>Reasons for not applying for a loan</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No need for a loan</td>
<td>31.88</td>
<td>51.87</td>
<td>19.99***</td>
</tr>
<tr>
<td>Complex application process</td>
<td>19.25</td>
<td>11.20</td>
<td>-8.05***</td>
</tr>
<tr>
<td>High interest rates</td>
<td>21.10</td>
<td>18.88</td>
<td>-2.22</td>
</tr>
<tr>
<td>High collateral requirements</td>
<td>10.28</td>
<td>5.39</td>
<td>-4.89***</td>
</tr>
<tr>
<td>Insufficient size and maturity of loans</td>
<td>2.88</td>
<td>2.49</td>
<td>-0.39</td>
</tr>
<tr>
<td>Did not think it would be approved</td>
<td>14.60</td>
<td>10.17</td>
<td>-4.44***</td>
</tr>
</tbody>
</table>

### Table A4—Recruitment Channels

<table>
<thead>
<tr>
<th>Channel</th>
<th>Domestic Firms (%)</th>
<th>Foreign Firms (%)</th>
<th>Difference (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Family/friends</td>
<td>63.86</td>
<td>41.40</td>
<td>-22.46***</td>
</tr>
<tr>
<td>Placement office</td>
<td>6.40</td>
<td>10.93</td>
<td>4.53***</td>
</tr>
<tr>
<td>Public advertisement</td>
<td>16.38</td>
<td>32.65</td>
<td>16.28***</td>
</tr>
<tr>
<td>Other</td>
<td>13.37</td>
<td>15.01</td>
<td>1.65</td>
</tr>
</tbody>
</table>

### Table A5—Labor Force Composition by Ownership

<table>
<thead>
<tr>
<th>Composition</th>
<th>Domestic Firms (%)</th>
<th>Foreign Firms (%)</th>
<th>Difference (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Type of worker</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Blue collar</td>
<td>75.08</td>
<td>72.16</td>
<td>-2.92***</td>
</tr>
<tr>
<td>White collar</td>
<td>24.92</td>
<td>27.84</td>
<td>2.92***</td>
</tr>
<tr>
<td>Supervision ratio</td>
<td>45.17</td>
<td>58.44</td>
<td>13.26***</td>
</tr>
<tr>
<td>Average total workforce</td>
<td>65.01</td>
<td>250.37</td>
<td>185.36***</td>
</tr>
<tr>
<td><strong>Education of the workforce†</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0 - 6 years</td>
<td>26.9</td>
<td>21.8</td>
<td>-5.11***</td>
</tr>
<tr>
<td>7 - 9 years</td>
<td>24.3</td>
<td>18.8</td>
<td>-5.54***</td>
</tr>
<tr>
<td>10 - 12 years</td>
<td>34.5</td>
<td>36.6</td>
<td>2.08</td>
</tr>
<tr>
<td>&gt; 12 years</td>
<td>14.2</td>
<td>22.8</td>
<td>8.55***</td>
</tr>
<tr>
<td><strong>Education of production workers</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0 - 6 years</td>
<td>41.8</td>
<td>31.3</td>
<td>-10.50***</td>
</tr>
<tr>
<td>7 - 9 years</td>
<td>48.6</td>
<td>53.8</td>
<td>5.21**</td>
</tr>
<tr>
<td>10 - 12 years</td>
<td>6.1</td>
<td>11.1</td>
<td>4.99***</td>
</tr>
<tr>
<td>&gt; 12 years</td>
<td>3.6</td>
<td>3.8</td>
<td>0.21</td>
</tr>
</tbody>
</table>

† This question was only asked in countries surveyed between 2002 and 2005
### Table A6—Firms Training Programs

<table>
<thead>
<tr>
<th>Component</th>
<th>Domestic Firms</th>
<th>Foreign Firms</th>
<th>Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>% of firms offering training programs</td>
<td>32.7%</td>
<td>52.6%</td>
<td>19.9%***</td>
</tr>
<tr>
<td>Training of skilled workers</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>% of workers trained</td>
<td>37.3%</td>
<td>40.1%</td>
<td>2.8%</td>
</tr>
<tr>
<td>Avg. number of weeks per worker</td>
<td>7.7</td>
<td>6.0</td>
<td>-1.7*</td>
</tr>
<tr>
<td>Training of unskilled workers</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>% of workers trained</td>
<td>29.6%</td>
<td>27.9%</td>
<td>-1.8%</td>
</tr>
<tr>
<td>Avg number of weeks per worker</td>
<td>10.3</td>
<td>7.1</td>
<td>-3.2**</td>
</tr>
</tbody>
</table>

### Table A7—Descriptive Statistics of Variables Used in the Regressions

<table>
<thead>
<tr>
<th>Variables</th>
<th>Mean</th>
<th>Median</th>
<th>Std Dev</th>
<th>Min</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>Domestic firm (dummy)</td>
<td>0.81</td>
<td>1</td>
<td>0.39</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Total sales per employee ($ thousands)</td>
<td>33.48</td>
<td>9.03</td>
<td>157.18</td>
<td>0.00</td>
<td>8,863</td>
</tr>
<tr>
<td>Labor to capital ratio ($)</td>
<td>3.09</td>
<td>0.00</td>
<td>45.61</td>
<td>0.00</td>
<td>2,665</td>
</tr>
<tr>
<td>Frac. of production workers</td>
<td>0.78</td>
<td>0.80</td>
<td>0.18</td>
<td>0.00</td>
<td>1.00</td>
</tr>
<tr>
<td>Net book value of capital ($ millions)</td>
<td>1.63</td>
<td>0.05</td>
<td>12.10</td>
<td>0.00</td>
<td>425</td>
</tr>
<tr>
<td>Export (dummy)</td>
<td>0.16</td>
<td>0.00</td>
<td>0.36</td>
<td>0.00</td>
<td>1.00</td>
</tr>
<tr>
<td>Age of the firm (years)</td>
<td>16.12</td>
<td>11.00</td>
<td>15.52</td>
<td>0.00</td>
<td>128</td>
</tr>
<tr>
<td>Firm location(dummy)</td>
<td>0.58</td>
<td>1.00</td>
<td>0.49</td>
<td>0.00</td>
<td>1.00</td>
</tr>
<tr>
<td>ISO certification (dummy)</td>
<td>0.18</td>
<td>0.00</td>
<td>0.38</td>
<td>0.00</td>
<td>1.00</td>
</tr>
<tr>
<td>Training program (dummy)</td>
<td>0.34</td>
<td>0.00</td>
<td>0.48</td>
<td>0.00</td>
<td>1.00</td>
</tr>
<tr>
<td>Overdraft/credit facilities (dummy)</td>
<td>0.42</td>
<td>0.00</td>
<td>0.49</td>
<td>0.00</td>
<td>1.00</td>
</tr>
<tr>
<td>Experience of top manager (years)</td>
<td>13.07</td>
<td>10.00</td>
<td>10.05</td>
<td>0.00</td>
<td>68.0</td>
</tr>
<tr>
<td>Unqualified workforce</td>
<td>0.14</td>
<td>0.00</td>
<td>0.35</td>
<td>0.00</td>
<td>1.00</td>
</tr>
<tr>
<td>is a major constraint (dummy)</td>
<td>0.27</td>
<td>0.00</td>
<td>0.45</td>
<td>0.00</td>
<td>1.00</td>
</tr>
<tr>
<td>Working capital is 100% internal(dummy)</td>
<td>0.28</td>
<td>0.00</td>
<td>0.45</td>
<td>0.00</td>
<td>1.00</td>
</tr>
</tbody>
</table>
Table A8—Explaining Labor to Capital ratio by Solidarity Status

<table>
<thead>
<tr>
<th>Equations</th>
<th>Better Solidarity Sample</th>
<th>Worse Solidarity Sample</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(1)</td>
<td>(2)</td>
</tr>
<tr>
<td>Constant</td>
<td>-6.133***</td>
<td>-5.741***</td>
</tr>
<tr>
<td></td>
<td>(12.30)</td>
<td>(8.15)</td>
</tr>
<tr>
<td>Domestic firm</td>
<td>0.165</td>
<td>0.416</td>
</tr>
<tr>
<td></td>
<td>(0.48)</td>
<td>(1.00)</td>
</tr>
<tr>
<td>Firms’ characteristics</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age of the firm (log)</td>
<td>0.055</td>
<td>0.101</td>
</tr>
<tr>
<td></td>
<td>(0.48)</td>
<td>(0.74)</td>
</tr>
<tr>
<td>Location dummy</td>
<td>0.022</td>
<td>0.035</td>
</tr>
<tr>
<td></td>
<td>(0.07)</td>
<td>(0.11)</td>
</tr>
<tr>
<td>Export dummy</td>
<td>-0.459**</td>
<td>-0.353</td>
</tr>
<tr>
<td></td>
<td>(2.28)</td>
<td>(1.59)</td>
</tr>
<tr>
<td>ISO certification</td>
<td>-0.123</td>
<td>-0.079</td>
</tr>
<tr>
<td></td>
<td>(0.68)</td>
<td>(0.37)</td>
</tr>
<tr>
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<tr>
<td>Working capital is 100% internal</td>
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OLS Method, Standard errors are clustered at the country / industry level. Absolute value of robust t-ratios in parentheses. * significant at 10%; ** significant at 5%; *** significant at 1%
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<td>ISO certification</td>
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<td>Training programs</td>
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<td>0.602***</td>
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OLS Method, Standard errors are clustered at the country / industry level. Absolute value of robust t-ratios in parentheses.

* significant at 10%; ** significant at 5%; *** significant at 1%
### Table A10—Structural Maximum Likelihood Estimates: Varying Capital

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<td>(0.0012) (0.0012)</td>
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Standard errors in parenthesis

### Table A11—Structural Semiparametric Estimates of the Model: Common capital

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Standard errors in parenthesis
Table A12—Structural Semiparametric Estimates of the Model: Varying Capital

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<th>Worse solidarity</th>
<th>Difference</th>
<th>Pvalue</th>
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Standard errors in parenthesis

Table A13—Structural Estimates with a Redefinition of Local Firm: Common Capital

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<th>Worse solidarity</th>
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<td>$m$</td>
<td>0.1259 (0.0034)</td>
<td>0.0841 (0.0043)</td>
<td>0.1742 (0.0053)</td>
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Standard errors in parenthesis

36
### Table A14—Structural Estimates with a Redefinition of Local Firm: Varying Capital

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<tr>
<th>Type</th>
<th>Parameter</th>
<th>Name</th>
<th>Whole sample</th>
<th>Better solidarity</th>
<th>Worse solidarity</th>
<th>Difference</th>
<th>P Value</th>
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<tr>
<td><strong>Foreigners</strong></td>
<td>Log ability - constant</td>
<td>$\delta_{0f}$</td>
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<td>-1.0385</td>
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</table>

Standard errors in parenthesis